SUBJECT: BLOOD PRESSURE SCREENING IN SCHOOL SETTINGS FOR HYPERTENSION

POLICY RECOMMENDATION: Students should be screened for hypertension according to the South Carolina Department of Health and Environmental Control (SCDHEC) School Screening Recommendations. Additionally, all students who present with signs and symptoms that indicate need should have their blood pressure (BP) status assessed and monitored. Education, counseling, and referral should be offered as indicated by the assessment.

RATIONALE:

- Mortality due to hypertension and heart disease in South Carolina is among the highest in the nation.
- Early identification followed by successful treatment may prevent heart disease, stroke and kidney failure.
- Elevated BP may be an early indication of the presence of other disease, stroke and kidney failure.
- Screening presents an excellent opportunity for health promotion related to cardiovascular health with a population of emerging adults.

STANDARDS:

1. In children and adolescents, the normal range of BP is determined by body size and age. BP standards that are based on gender, age, and height provide a more precise classification of BP according to body size.

2. Normal BP in children and adolescents is defined as systolic BP and diastolic BP that is < the 90th BP percentile for gender, age, and height.

3. Prehypertension in children and adolescents is defined as average systolic BP and/or diastolic BP levels that are > or = the 90th BP percentile but < the 95th BP percentile for gender, age, and height on three or more occasions. Prehypertension is an indication of heightened risk for developing hypertension.

4. Children and adolescents with BP levels > or = 120/80 mm Hg but < the 95th BP percentile should be considered prehypertensive.

5. Hypertension in children and adolescents is defined as average systolic BP and/or diastolic BP that is > or = the 95th BP percentile for gender, age, and height on three or more occasions.

6. When diagnosing hypertension, health care providers classify hypertension according to two stages – Stage 1 and Stage 2. Stage 1 hypertension is an average systolic BP and/or diastolic BP that is between the 95th BP percentile and the 99th BP percentile plus 5 mm Hg, inclusive. Stage 2 hypertension is an average systolic BP and/or diastolic BP that is > the 99th BP percentile plus 5 mm

Hg. For the purpose of screening referral, hypertensive levels within the Stage 2 classification will warrant priority referral.

7. School nurses should organize and implement a BP assessment program, which includes screening and education of risk factors associated with hypertension and cardiovascular disease.

8. Screening may be accomplished as a collaborative community effort with qualified staff from other agencies or with trained volunteers under the school nurse's supervision. If volunteers are used, training regarding confidentiality should be a component of the training content.

9. Screening must be conducted in a quiet environment with necessary equipment.

10. When measuring BP, use a stethoscope, sphygmomanometer and correct size cuffs (pediatric, adult or large adult). The preferred method of BP measurement is auscultation. Measures obtained by oscillometric devices that exceed the 90th BP percentile should be repeated by auscultation.

11. When measuring the student's height for use in assessing the student's BP a vertical measurement board (stadiometer), metallic measuring tape or yardstick attached to a flat wall with no baseboard should be used. A movable right triangular headboard should be used to site the accurate height. This may be attached to the measurement board or separate if using a metallic measuring tape or yardstick. Do not use the measuring rod attached to the platform scale. The platform scale provides neither a steady standing base nor an adequate vertical surface for appropriately positioning children for accurate height measurements.

12. Equipment should be maintained and calibrated according to the manufacturer's guidelines to assure accurate measurements. Some sources recommend calibration of aneroid manometers on a semi-annual basis.

13. Equipment should be cleaned prior to each use and when necessary to minimize the spread of infection. Screening should be conducted in a manner congruent with infection control and standard precautions.

14. Trained personnel should follow standard practices and procedures for measuring BP.

15. Parents/guardians should be notified of their child's screening results and provided information regarding cardiovascular health maintenance.

16. All students with a BP assessment that varies from the norm should receive a referral to their health care practitioner for evaluation and treatment as indicated.

17. Each student's BP screening results, referral, and follow-up should be documented in the student's school health record.

PROCEDURE:

Preparation

1. Every effort should be made to ensure the students' privacy during the screening process.

2. Locate a quiet room for conducting the BP screenings.

3. Work with the appropriate persons within the school to coordinate the screening activity. The process for coordination with teachers varies among schools. There may be preferred classes during which screenings are usually allowed (for an example, some schools prefer to schedule screenings during a related arts class).

4. Develop or obtain forms for recording the results of the screening for each student. Don't forget to have the appropriate gender specific CDC stature-for-age growth charts available. These charts are available at http://www.cdc.gov/nchs/about/major/nhanes/growthcharts/clinical_charts.htm.

5. Develop or obtain parent/guardian notification forms and educational brochures. See Appendix A for sample parent/guardian notification forms.

6. Check to be sure that the sphygmomanometer (manometer) has been calibrated in accordance with the manufacturer's suggestions.

7. Check the functionality of all equipment.

8. Prior to screening, students should be given an explanation of hypertension, ways to help maintain a normal BP, and an overview of the screening process. Advise students of the possibility that shoes will need to be removed and hairstyles may need to be adjusted in order to secure an accurate height measurement. Also advise students of clothing options that allow ease of baring the right arm for BP measurement. This may be done via a classroom instructional unit or if necessary, individually.

9. Prior to conducting the screening, set up the room for screening one student at a time or use a privacy partition if more than one screener will be working in the same room.

10. Preferably, the student being screened should not be able to see or hear other students.

11. The student should be able to be seated with feet flat on the floor with right arm supported at heart level on a table or desk.

12. The screener may choose to stand or be seated during the BP measurement phase of the procedure, thus a chair for the screener will be necessary.

13. The room should have an area without a baseboard for mounting the metallic yardstick or stadiometer that will be used for measuring height.

14. To assist with the flow of students, you may wish to have a teacher or staff assistant monitor students waiting to be screened in an adjacent room or hallway. Once a student has been screened, he/she can join his/her classmates and the next student to be screened can then enter the screening room.

15. Have supplies available to clean the equipment per the manufacturer's suggestions between each student.

BP Screening

1. As appropriate, prior to checking a student's BP, the examiner should ask the caretaker or the student about the student's health history to determine if any risk factors exist that may cause BP readings to vary from the norm.

2. Screen for BP using an age and developmentally appropriate screening process. Talk with the student using age and developmentally appropriate terms. You may need to use words like "pressure" rather than <u>blood</u> pressure, and "arrow" rather than <u>needle</u>.

3. Explain to the student that you will be measuring his/her BP to determine if it is within a normal range or high range. Let the student know that a person's BP changes during the day depending upon many factors (e.g., activity level, diet, medications). Advise the student that if the measurement is high, you will recheck his/her BP and may want to check it again on another day to see if the BP measurement is still high. Help the student to understand that if his/her BP remains high after you have checked it several times, you will suggest that the student's parents/guardians have a health care practitioner check to determine if the student has hypertension. The results of the BP screening do not mean that the student has hypertension; it means that the BP measurement was high during the screening activity.

4. Assess the BP.
   a. Prior to measuring BP, allow the student to rest at least 3-5 minutes.
   b. Explain the process to the student.
   c. Position student appropriately:
      (1) Student's feet should be flat on floor.
      (2) Student should be leaning gently against back of chair, not on arm.

(3) The entire arm in which the BP will be measured should be fully supported on a firm surface (table) with the brachial artery at heart level.
(4) Upper arm should be bare – do not apply cuff over clothing.

d. Choose appropriate cuff size:
(1) The screener must ensure that the rubber bladder completely encircles the student's arm and the width of the bladder covers approximately 75% of the upper arm. Most modern cuffs are marked with range lines to denote need to use larger or smaller cuff. Proper cuff size is essential for measuring BP accurately.
(2) If there is a question between two cuffs, use the larger one. A cuff that is too small may result in an artificially elevated BP whereas a slightly larger cuff is unlikely to cause a falsely elevated BP level.

e. Place the BP cuff on the upper right arm:
(1) Leave enough room at the top of the cuff to prevent obstruction to the axilla and enough room at the bottom to place the stethoscope in the antecubital fossa.
(2) Position the right arm so that the brachial artery is at heart level.
(3) The right arm is preferred for consistency and comparison with standard tables for BP parameters and because of the possibility of coarctation of the aorta, which might result in false low readings in the left arm.

f. To determine how far to inflate the cuff for measuring the student's BP:
(1) Palpate for the radial pulse.
(2) Inflate the cuff while palpating the radial pulse.
(3) Note the level at which the radial pulse disappears.
(4) Release air from cuff rapidly and wait 15 seconds prior to measuring the student's BP.
(5) When measuring the BP, inflate the cuff 20 – 30 mm Hg above the point where the radial pulse disappeared.

g. After the 15-second wait period, measure the student's BP:
(1) Palpate the brachial pulse.
(2) Place the ear tips of the stethoscope in your ears with tips facing forward.
(3) Place the diaphragm of the stethoscope over the brachial artery. The diaphragm of the stethoscope should not touch the cuff.
(4) Rapidly inflate cuff 20 – 30 mm Hg above the point at which the radial pulse disappeared.
(5) Release cuff pressure at a rate of 2-3 mm Hg per second, while auscultating brachial artery.
(6) The systolic BP reading is taken at the onset of a clear tapping sound (1st Korotkoff sound).
(7) The diastolic BP reading is taken at the disappearance of Korotkoff sounds (5th Korotkoff sound). After the disappearance of Korotkoff sounds, continue to deflate the cuff slowly for another

10 mm Hg. If no further sounds are heard, rapidly release all air in the cuff and record the BP measurement.

(8) If the Korotkoff sounds continue to 0 mm Hg or is very low, repeat the BP measurement with less pressure on the head of the stethoscope.

(9) If the very low 5th Korotkoff sound persists record the 4th Korotkoff (muffling of the sounds) as the diastolic BP.

Height Assessment

1. If you do not already have a current height measurement for the student, measure the student's height and plot it on the appropriate gender specific CDC stature-for-age growth chart. These charts are available at http://www.cdc.gov/nchs/about/major/nhanes/growthcharts/clinical_charts.htm.

2. School aged children able to stand on their own should be measured standing, without shoes, using a vertical measurement board (stadiometer) or a metallic measuring tape/yardstick attached to a flat wall with no baseboard. A movable right triangular headboard should be used when actually measuring height. Do not use the measuring rod attached to the platform scale. The platform scale does provides neither a steady standing base nor an adequate vertical surface for appropriately positioning children for accurate height measurements.

3. Prior to starting, check measurement board to ensure it is working correctly. The headboard should slide easily, but should not be so loose or worn that it slips when measuring the child's height.

4. Remove the child's shoes, hats, and bulky clothing, such as coats and sweaters. Undo or adjust hairstyles and remove hair accessories that interfere with measurement.

5. Have the student stand erect, with shoulders level, hands at sides, knees or thighs together and weight evenly distributed on both feet.

6. The student's feet should be flat on the floor or foot piece, with both heels at base of the vertical board. When possible, all four contact points (i.e., the head, back, buttocks, and heels) should touch the vertical surface while maintaining a natural stance. Some students will not be able to maintain a natural stance with all four contact points touching the vertical surface. For these students, at a minimum, two contact points - the head and buttocks, or the buttocks and heels should always touch the vertical surface.

7. Position the student's head by placing a hand on the student's chin to move the head into the Frankfort Plane as shown in the illustration on page 7. The Frankfort Plane is an imaginary line from the lower margin of the eye socket to the notch above the tragus of the ear. When aligned correctly, the Frankfort Plane is parallel to the horizontal headboard and perpendicular to the vertical

measurement board. This is best viewed and aligned when the screener is directly to the side and at eye level with the child.

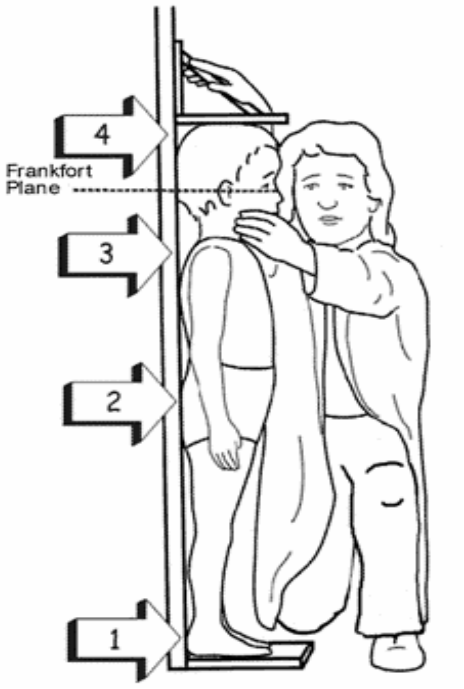
8. Lower the headpiece until it firmly touches the crown of the head and is at a right angle with the measurement surface.

9. Check contact points to ensure that the lower body stays in the proper position and heels remain flat. Some students may stand up on their toes, but verbal reminders are usually sufficient to get them in proper position.

10. Read the height measurement to the nearest 1/8 inch (or 1 cm) and record in the student's school health record.

11. Follow procedural steps above as closely as possible if vertical measurement board is not available.

12. Plot the student's height on the appropriate gender specific CDC stature-for-age growth chart. These charts are available at http://www.cdc.gov/nchs/about/major/nhanes/growthcharts/clinical_charts.htm.



Assess BP Status

1. Determine height percentile of the student using the appropriate gender specific CDC growth chart. If the student's height percentile is between two percentiles, use the higher height percentile.

2. Utilize the gender specific BP tables (Appendix B) to determine if the student's BP is normotensive, prehypertensive, hypertensive, or in the hypertensive priority referral range. This table was developed based on the BP percentile levels established by the National High BP Education Program Working Group on High BP in Children and Adolescents (see References).

3. Compare the student's systolic and diastolic BP measurements with the level provided in the BP tables for age and height percentile using the correct gender table to determine if the measurement falls in a normal or abnormal category.

4. For students or personnel over 18 years of age, use the following guidelines for determining if the BP measurement is normal, prehypertensive, hypertensive, or in the priority range.
   - Normotensive: systolic < 120 mm Hg; diastolic < 80 mm Hg
   - Prehypertensive: systolic > or = 120 – 139 mm Hg and/or diastolic > or = 80 – 89 mm Hg
   - Hypertensive: systolic > or = 140 mm Hg and/or diastolic > or = 90 mm Hg
   - Priority Referral: systolic > or = 160 mm Hg and/or diastolic > or =100

5. Assessment & Referral Criteria:
   a. In presenting these guidelines we acknowledge that the school nurse may exercise her/his clinical judgment regarding referral decisions.
   b. Keep in mind that for all ages and heights a BP measurement that is > or = 120/80 (diastolic and/or systolic) is considered prehypertensive, unless the BP reading for the student's height and age is in the hypertensive category.
   c. If the student's BP (systolic and diastolic) is normotensive: provide educational material regarding healthy diet, sleep and physical activity for maintaining a healthy cardiovascular system.
   d. If the student's BP (systolic and/or diastolic) is prehypertensive: provide educational material regarding healthy diet, sleep and physical activity and recheck the student's BP again within two weeks, on two separate visits that are a few days apart. Average the three measurements. If averaged measurement is prehypertensive, recommend that the parent/legal guardian notify the student's health care practitioner at the student's next regularly scheduled visit.
   e. If student's BP (systolic and/or diastolic) is hypertensive, but not in the priority referral range, assess for other symptoms of hypertension (e.g. headaches, blurred vision, feeling faint) and/or other activities that might explain a high BP (e.g., exercise prior to BP measurement, caffeine intake, medications).
      - If symptomatic, ask the student to rest for 15 minutes; then recheck the student's BP. Average the two measurements. Provide educational material regarding healthy diet, sleep and physical activity and refer for evaluation by the student's health care practitioner.
      - If not symptomatic, recheck the student's BP again within one week, on two separate visits that are a few days apart. Average the three

measurements. Refer for evaluation by the student's health care practitioner if averaged measurement is elevated.

f. If BP (systolic and/or diastolic) falls in the priority referral range on the gender specific BP tables, assess for other symptoms of hypertension (e.g. headaches, blurred vision, feeling faint) and/or other activities that might explain a high BP (e.g., exercise prior to BP measurement, caffeine intake, medications). Ask the student to rest for 15 minutes and then recheck the student's BP. Average the two measurements. Provide educational material regarding healthy diet, sleep and physical activity and refer for evaluation by the student's health care practitioner. A telephone call to the student's parent/guardian should be placed within 24 hours to discuss the BP screening results and to assist with referral completion.
g. Referrals for assessment, treatment, and follow-up, may be made using the appropriate parent/notification form in Appendix A.

6. Parents/guardians should be notified of their students' screening results, whether normal or abnormal.

7. Education and counseling should be provided about normal findings, deviations from normal, and for any specific concerns identified during the visit.

8. Efforts should be made by the school nurse to assist parents/guardians with referral completion.

9. All findings, referrals, and follow-up should be documented in the student's school health record.

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Date of Approval: April 4, 2006

Appendix A
Parent Notification Forms

Healthy Children Learn Better	SCHOOL HEALTH PROGRAM BLOOD PRESSURE SCREENING REFERRAL

Student's Name:	DOB:	Age:

Dear Parent / Guardian:

Blood pressure screening is one of the preventive health services provided by the school health program. Your child's class was recently screened for blood pressure problems. I've noted the results below. Your child's blood pressure was higher than normal. Please call me if you have questions or concerns.

We recommend that you have your child's blood pressure checked by his/her health care provider.

☐ At your child's next regularly scheduled visit

☐ Schedule an appointment as soon as possible

☐ _____

Please ask the health care provider to complete the form below and return it to the school nurse.

Thanks for helping to keep your child healthy. Healthy children learn better.

School Nurse:	Date:
School:	School Telephone:
Address:	

Date of Screening	Blood Pressure Reading	Cuff Size Used
1.		☐ pediatric ☐ adult ☐ large adult
2.		☐ pediatric ☐ adult ☐ large adult
3.		☐ pediatric ☐ adult ☐ large adult
Height:	Height Percentile:	Average BP Reading:

Health Care Provider's Report of Evaluation of Blood Pressure

Student's Name:	
Examination Findings:	
Recommendations / Treatments:	
Do you wish to have this student's BP monitored at school? ☐ No ☐ Yes, frequency:	
Physician's Name (please print):	
Physician's Signature:	
Office Phone:	Date:

Please return to the school nurse.

Healthy Children Learn Better	SCHOOL HEALTH PROGRAM BLOOD PRESSURE SCREENING REPORT (Normal)

Student's Name:	DOB:	Age:

Dear Parent / Guardian:

Blood pressure screening is one of the preventive health services provided by the school health program. Your child's class was recently screened for blood pressure problems. I've noted the results below. Your child's blood pressure was normal.

A balanced lifestyle that includes a healthy diet, exercise, and enough sleep helps to keep blood pressure normal.

Thanks for helping to keep your child healthy. Healthy children learn better.

School Nurse:	Date:
School:	Telephone:

Date of Screening	Blood Pressure Reading	Cuff Size Used
		☐ pediatric ☐ adult ☐ large adult

Height:	Height Percentile:

Healthy Children Learn Better	SCHOOL HEALTH PROGRAM BLOOD PRESSURE SCREENING REPORT (Normal)

Student's Name:	DOB:	Age:

Dear Parent / Guardian:

Blood pressure screening is one of the preventive health services provided by the school health program. Your child's class was recently screened for blood pressure problems. I've noted the results below. Your child's blood pressure was normal.

A balanced lifestyle that includes a healthy diet, exercise, and enough sleep helps to keep blood pressure normal.

Thanks for helping to keep your child healthy. Healthy children learn better.

School Nurse:	Date:
School:	Telephone:

Date of Screening	Blood Pressure Reading	Cuff Size Used
		☐ pediatric ☐ adult ☐ large adult

Height:	Height Percentile:

Healthy Children Learn Better	SCHOOL HEALTH PROGRAM BLOOD PRESSURE SCREENING REPORT (RESCREEN)

Student's Name:	DOB:	Age:

Dear Parent / Guardian:

Blood pressure screening is one of the preventive health services provided by the school health program. Your child's class was recently screened for blood pressure problems. I've noted the results below. Your child's blood pressure was higher than normal when we checked it.

This does not mean that your child has high blood pressure (hypertension). There are many things that can make a person's blood pressure high so we will check your child's blood pressure again over the next two weeks to see if it remains high. We will let you know the results by sending home a form like this one. Please call me if you have questions.

A balanced lifestyle that includes a healthy diet, exercise, and enough sleep helps to keep blood pressure normal.

Thanks for helping to keep your child healthy. Healthy children learn better.

School Nurse:	Date:
School:	Telephone:

Date of Screening	Blood Pressure Reading	Cuff Size Used
		☐ pediatric ☐ adult ☐ large adult
Height:	Height Percentile:	

Date of Screening	Blood Pressure Reading	Cuff Size Used
		☐ pediatric ☐ adult ☐ large adult
Height:	Height Percentile:	

Date of Screening	Blood Pressure Reading	Cuff Size Used
		☐ pediatric ☐ adult ☐ large adult
Height:	Height Percentile:	

Appendix B
Gender Specific BP Tables

Guide for Interpreting BP Screening Results for Children and Adolescents (Females)

Based on "The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents" (National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents, August 2004, Pediatrics, 114(2)).

Keep in mind that for all ages and heights a BP measurement that is > or = 120/80 (diastolic and/or systolic) is considered prehypertensive, unless the BP reading for the student's height and age is in the hypertensive category.

(Chart for Females)

		Systolic BP, mm Hg							Diastolic BP, mm Hg						
Age	Interpretation	Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
1	Normotensive (< or =)	96	96	97	99	100	101	102	51	52	52	53	54	54	55
	Prehypertensive	97 – 99	97 – 100	98 – 101	100 – 103	101 – 104	102 – 105	103 – 106	52 – 55	53 – 56	53 – 56	54 – 57	55 – 58	55 – 58	56 – 59
	Hypertensive (> or =)	100 – 113	101 – 113	102 – 114	104 – 116	105 – 117	106 – 118	107 – 119	56 – 69	57 – 69	57 – 70	58 – 70	59 – 71	59 – 72	60 – 72
	Priority Refer (> or =)	114	114	115	117	118	119	120	70	70	71	71	72	73	73
2	Normotensive (< or =)	97	98	99	100	102	103	104	56	57	57	58	59	60	60
	Prehypertensive	98 – 101	99 – 102	100 – 103	101 – 104	103 – 106	104 – 107	105 – 108	57 – 60	58 – 61	58 – 61	59 – 62	60 – 63	61 – 64	61 – 64
	Hypertensive (> or =)	102 – 114	103 – 115	104 – 116	105 – 117	107 – 119	108 – 120	109 – 121	61 – 74	62 – 74	62 – 75	63 – 75	64 – 76	65 – 77	65 – 77
	Priority Refer (> or =)	115	116	117	118	120	121	122	75	75	76	76	77	78	78
3	Normotensive (< or =)	99	99	101	102	103	105	105	60	61	61	62	63	63	64
	Prehypertensive	100 – 103	100 – 103	102 – 104	103 – 106	104 – 107	106 – 108	106 – 109	61 – 64	62 – 65	62 – 65	63 – 66	64 – 67	64 – 67	65 – 68
	Hypertensive (> or =)	104 – 116	104 – 116	105 – 118	107 – 119	108 – 120	109 – 121	110 – 122	65 – 78	66 – 78	66 – 79	67 – 79	68 – 80	68 – 81	69 – 81
	Priority Refer (> or =)	117	117	119	120	121	122	123	79	79	80	80	81	82	82

Keep in mind that for all ages and heights a BP measurement that is > or = 120/80 (diastolic and/or systolic) is considered prehypertensive, unless the BP reading for the student's height and age is in the hypertensive category.

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(Chart for Females)

		Systolic BP, mm Hg							Diastolic BP, mm Hg						
Age	Interpretation	Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
4	Normotensive (< or =)	100	101	102	103	105	106	107	63	63	64	65	66	66	67
	Prehypertensive	101 – 104	102 – 105	103 – 106	104 – 107	106 – 109	107 – 110	108 – 111	64 – 67	64 – 67	65 – 68	66 – 69	67 – 70	67 – 70	68 – 71
	Hypertensive (> or =)	105 – 117	106 – 118	107 – 119	108 – 120	110 – 122	111 – 123	112 – 124	68 – 81	68 – 81	69 – 81	70 – 82	71 – 83	71 – 84	72 – 84
	Priority Refer (> or =)	118	119	120	121	123	124	125	82	82	82	83	84	85	85
5	Normotensive (< or =)	102	102	104	105	106	108	108	65	66	66	67	68	68	69
	Prehypertensive	103 – 106	103 – 106	105 – 107	106 – 109	107 – 110	109 – 111	109 – 112	66 – 69	67 – 70	67 – 70	68 – 71	69 – 72	69 – 72	70 – 73
	Hypertensive (> or =)	107 – 119	107 – 119	108 – 121	110 – 122	111 – 123	112 – 125	113 – 125	70 – 83	71 – 83	71 – 84	72 – 84	73 – 85	73 – 86	74 – 86
	Priority Refer (> or =)	120	120	122	123	124	126	126	84	84	85	85	86	87	87
6	Normotensive (< or =)	103	104	105	107	108	109	110	67	67	68	69	69	70	71
	Prehypertensive	104 – 107	105 – 108	106 – 109	108 – 110	109 – 112	110 – 113	111 – 114	68 – 71	68 – 71	69 – 72	70 – 73	70 – 73	71 – 74	72 – 75
	Hypertensive (> or =)	108 – 120	109 – 121	110 – 122	111 – 124	113 – 125	114 – 126	115 – 127	72 – 85	72 – 85	73 – 85	74 – 86	74 – 87	75 – 88	76 – 88
	Priority Refer (> or =)	121	122	123	125	126	127	128	86	86	86	87	88	89	89
7	Normotensive (< or =)	105	106	107	108	110	111	112	68	69	69	70	71	71	72
	Prehypertensive	106 – 109	107 – 110	108 – 111	109 – 112	111 – 114	112 – 115	113 – 115	69 – 72	70 – 73	70 – 73	71 – 74	72 – 75	72 – 75	73 – 76
	Hypertensive (> or =)	110 – 122	111 – 123	112 – 124	113 – 125	115 – 127	116 – 128	116 – 129	73 – 86	74 – 86	74 – 87	75 – 87	76 – 88	76 – 89	77 – 89
	Priority Refer (> or =)	123	124	125	126	128	129	130	87	87	88	88	89	90	90

Keep in mind that for all ages and heights a BP measurement that is > or = 120/80 (diastolic and/or systolic) is considered prehypertensive, unless the BP reading for the student's height and age is in the hypertensive category.

Keep in mind that for all ages and heights a BP measurement that is > or = 120/80 (diastolic and/or systolic) is considered prehypertensive, unless the BP reading for the student's height and age is in the hypertensive category.

(Chart for Females)

		Systolic BP, mm Hg							Diastolic BP, mm Hg						
Age	Interpretation	Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
8	Normotensive (< or =)	107	108	109	110	112	113	113	70	70	70	71	72	73	73
	Prehypertensive	108 – 111	109 – 111	110 – 113	111 – 114	113 – 115	114 – 117	114 – 117	71 – 74	71 – 74	71 – 74	72 – 75	73 – 76	74 – 77	74 – 77
	Hypertensive (> or =)	112 – 124	112 – 125	114 – 126	115 – 127	116 – 128	118 – 130	118 – 130	75 – 87	75 – 87	75 – 88	76 – 88	77 – 89	78 – 90	78 – 91
	Priority Refer (> or =)	125	126	127	128	129	131	131	88	88	89	89	90	91	92
9	Normotensive (< or =)	109	109	111	112	113	115	115	71	71	71	72	73	74	74
	Prehypertensive	110 – 113	110 – 113	112 – 114	113 – 116	114 – 117	116 – 118	116 – 119	72 – 75	72 – 75	72 – 75	73 – 76	74 – 77	75 – 78	75 – 78
	Hypertensive (> or =)	114 – 126	114 – 126	115 – 128	117 – 129	118 – 130	119 – 132	120 – 132	76 – 88	76 – 88	76 – 89	77 – 89	78 – 90	79 – 91	79 – 92
	Priority Refer (> or =)	127	127	129	130	131	133	133	89	89	90	90	91	92	93
10	Normotensive (< or =)	111	111	113	114	115	117	117	72	72	72	73	74	75	75
	Prehypertensive	112 – 115	112 – 115	114 – 116	115 – 118	116 – 119	118 – 120	118 – 121	73 – 76	73 – 76	73 – 76	74 – 77	75 – 78	76 – 79	76 – 79
	Hypertensive (> or =)	116 – 128	116 – 128	117 – 130	119 – 131	120 – 132	121 – 134	122 – 134	77 – 89	77 – 89	77 – 90	78 – 91	79 – 91	80 – 92	80 – 93
	Priority Refer (> or =)	129	129	131	132	133	135	135	90	90	91	92	92	93	94
11	Normotensive (< or =)	113	113	115	116	117	118	119	73	73	73	74	75	76	76
	Prehypertensive	114 – 117	114 – 117	116 – 118	117 – 120	118 – 121	119 – 122	120 – 123	74 – 77	74 – 77	74 – 77	75 – 78	76 – 79	77 – 80	77 – 80
	Hypertensive (> or =)	118 – 130	118 – 130	119 – 131	121 – 133	122 – 134	123 – 135	124 – 136	78 – 90	78 – 90	78 – 91	79 – 92	80 – 92	81 – 93	81 – 94
	Priority Refer (> or =)	131	131	132	134	135	136	137	91	91	92	93	93	94	95

Keep in mind that for all ages and heights a BP measurement that is > or = 120/80 (diastolic and/or systolic) is considered prehypertensive, unless the BP reading for the student's height and age is in the hypertensive category.

Keep in mind that for all ages and heights a BP measurement that is > or = 120/80 (diastolic and/or systolic) is considered prehypertensive, unless the BP reading for the student's height and age is in the hypertensive category.

(Chart for Females)

		Systolic BP, mm Hg							Diastolic BP, mm Hg						
Age	Interpretation	Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
12	Normotensive (< or =)	115	115	116	118	119	120	121	74	74	74	75	76	77	77
	Prehypertensive	116 – 118	116 – 119	117 – 120	119 – 122	120 – 123	121 – 124	122 – 125	75 – 78	75 – 78	75 – 78	76 – 79	77 – 80	78 – 81	78 – 81
	Hypertensive (> or =)	119 – 132	120 – 132	121 – 133	123 – 135	124 – 136	125 – 137	126 – 138	79 – 91	79 – 91	79 – 92	80 – 93	81 – 93	82 – 94	82 – 95
	Priority Refer (> or =)	133	133	134	136	137	138	139	92	92	93	94	94	95	96
13	Normotensive (< or =)	116	117	118	120	121	122	123	75	75	75	76	77	78	78
	Prehypertensive	117 – 120	118 – 121	119 – 122	121 – 123	122 – 125	123 – 126	124 – 127	76 – 79	76 – 79	76 – 79	77 – 80	78 – 81	79 – 82	79 – 82
	Hypertensive (> or =)	121 – 133	122 – 134	123 – 135	124 – 137	126 – 138	127 – 139	128 – 140	80 – 92	80 – 92	80 – 93	81 – 94	82 – 94	83 – 95	83 – 96
	Priority Refer (> or =)	134	135	136	138	139	140	141	93	93	94	95	95	96	97
14	Normotensive (< or =)	118	119	120	121	123	124	124	76	76	76	77	78	79	79
	Prehypertensive	119 – 122	120 – 122	121 – 124	122 – 125	124 – 126	125 – 128	125 – 128	77 – 80	77 – 80	77 – 80	78 – 81	79 – 82	80 – 83	80 – 83
	Hypertensive (> or =)	123 – 135	123 – 136	125 – 137	126 – 138	127 – 140	129 – 141	129 – 141	81 – 93	81 – 93	81 – 94	82 – 95	83 – 95	84 – 96	84 – 97
	Priority Refer (> or =)	136	137	138	139	141	142	142	94	94	95	96	96	97	98
15	Normotensive (< or =)	119	120	121	122	124	125	126	77	77	77	78	79	80	80
	Prehypertensive	120 – 123	121 – 124	122 – 125	123 – 126	125 – 128	126 – 129	127 – 130	78 – 81	78 – 81	78 – 81	79 – 82	80 – 83	81 – 84	81 – 84
	Hypertensive (> or =)	124 – 136	125 – 137	126 – 138	127 – 139	129 – 141	130 – 142	131 – 143	82 – 94	82 – 94	82 – 95	83 – 96	84 – 96	85 – 97	85 – 98
	Priority Refer (> or =)	137	138	139	140	142	143	144	95	95	96	97	97	98	99

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Keep in mind that for all ages and heights a BP measurement that is > or = 120/80 (diastolic and/or systolic) is considered prehypertensive, unless the BP reading for the student's height and age is in the hypertensive category.

(Chart for Females)

		Systolic BP, mm Hg							Diastolic BP, mm Hg						
Age	Interpretation	Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
16	Normotensive (< or =)	120	121	122	123	125	126	127	77	77	78	79	80	80	81
	Prehypertensive	121 – 124	122 – 125	123 – 126	124 – 127	126 – 129	127 – 130	128 – 131	78 – 81	78 – 81	79 – 82	80 – 83	81 – 84	81 – 84	82 – 85
	Hypertensive (> or =)	125 – 137	126 – 138	127 – 139	128 – 140	130 – 142	131 – 143	132 – 144	82 – 95	82 – 95	83 – 95	84 – 96	85 – 97	85 – 98	86 – 98
	Priority Refer (> or =)	138	139	140	141	143	144	145	96	96	96	97	98	99	99
17	Normotensive (< or =)	121	121	122	124	125	126	127	77	78	78	79	80	80	81
	Prehypertensive	122 – 124	122 – 125	123 – 126	125 – 128	126 – 129	127 – 130	128 – 131	78 – 81	79 – 82	79 – 82	80 – 83	81 – 84	81 – 84	82 – 85
	Hypertensive (> or =)	125 – 138	126 – 138	127 – 139	129 – 141	130 – 142	131 – 143	132 – 144	82 – 95	83 – 95	83 – 96	84 – 96	85 – 97	85 – 98	86 – 98
	Priority Refer (> or =)	139	139	140	142	143	144	145	96	96	97	97	98	99	99

Keep in mind that for all ages and heights a BP measurement that is > or = 120/80 (diastolic and/or systolic) is considered prehypertensive, unless the BP reading for the student's height and age is in the hypertensive category.

For students or personnel over 18 years of age, use the following guidelines for determining if the blood pressure measurement is normal, prehypertensive, hypertensive, or in the priority range.

- Normotensive: systolic < 120 mm Hg; diastolic < 80 mm Hg
- Prehypertensive: systolic > or = 120 – 139 mm Hg and/or diastolic > or = 80 – 89 mm Hg
- Hypertensive: systolic > or = 140 mm Hg and/or diastolic > or = 90 mm Hg
- Priority Referral: systolic > or = 160 mm Hg and/or diastolic > or =100

Guide for Interpreting BP Screening Results (Males)

Based on "The Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents" (National High Blood Pressure Education Program Working Group on High Blood Pressure in Children and Adolescents, August 2004, Pediatrics, 114(2)).

Keep in mind that for all ages and heights a BP measurement that is > or = 120/80 (diastolic and/or systolic) is considered prehypertensive, unless the BP reading for the student's height and age is in the hypertensive category.

(Chart for Males)

		Systolic BP, mm Hg							Diastolic BP, mm Hg						
Age	Interpretation	Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
1	Normotensive (< or =)	93	94	96	98	99	101	102	48	49	50	51	52	52	53
	Prehypertensive	94 – 97	95 – 98	97 – 100	99 – 102	100 – 103	102 – 105	103 – 105	49 – 53	50 – 53	51 – 54	52 – 55	53 – 56	53 – 57	54 – 57
	Hypertensive (> or =)	98 – 110	99 – 111	101 – 113	103 – 115	104 – 117	106 – 118	106 – 119	54 – 66	54 – 67	55 – 68	56 – 69	57 – 70	58 – 71	58 – 71
	Priority Refer (> or =)	111	112	114	116	118	119	120	67	68	69	70	71	72	72
2	Normotensive (< or =)	96	98	99	101	103	104	105	53	54	55	56	57	57	58
	Prehypertensive	97 – 100	99 – 101	100 – 103	102 – 105	104 – 107	105 – 108	106 – 109	54 – 58	55 – 58	56 – 59	57 – 60	58 – 61	58 – 62	59 – 62
	Hypertensive (> or =)	101 – 114	102 – 115	104 – 116	106 – 118	108 – 120	109 – 122	110 – 122	59 – 71	59 – 72	60 – 73	61 – 74	62 – 75	63 – 76	63 – 76
	Priority Refer (> or =)	115	116	117	119	121	123	123	72	73	74	75	76	77	77
3	Normotensive (< or =)	99	100	102	104	106	107	108	58	58	59	60	61	62	62
	Prehypertensive	100 – 103	101 – 104	103 – 106	105 – 108	107 – 109	108 – 111	109 – 112	59 – 62	59 – 62	60 – 63	61 – 64	62 – 65	63 – 66	63 – 66
	Hypertensive (> or =)	104 – 116	105 – 117	107 – 119	109 – 121	110 – 123	112 – 124	113 – 125	63 – 76	63 – 76	64 – 77	65 – 78	66 – 79	67 – 80	67 – 80
	Priority Refer (> or =)	117	118	120	122	124	125	126	77	77	78	79	80	81	81

Keep in mind that for all ages and heights a BP measurement that is > or = 120/80 (diastolic and/or systolic) is considered prehypertensive, unless the BP reading for the student's height and age is in the hypertensive category.

Keep in mind that for all ages and heights a BP measurement that is > or = 120/80 (diastolic and/or systolic) is considered prehypertensive, unless the BP reading for the student's height and age is in the hypertensive category.

(Chart for Males)

		Systolic BP, mm Hg							Diastolic BP, mm Hg						
Age	Interpretation	Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
4	Normotensive (< or =)	101	102	104	106	108	109	110	61	62	63	64	65	65	66
	Prehypertensive	102 – 105	103 – 106	105 – 108	107 – 110	109 – 111	110 – 113	111 – 114	62 – 65	63 – 66	64 – 67	65 – 68	66 – 69	66 – 70	67 – 70
	Hypertensive (> or =)	106 – 118	107 – 119	109 – 121	111 – 123	112 – 125	114 – 126	115 – 127	66 – 79	67 – 80	68 – 81	69 – 82	70 – 83	71 – 83	71 – 84
	Priority Refer (> or =)	119	120	122	124	126	127	128	80	81	82	83	84	84	85
5	Normotensive (< or =)	103	104	105	107	109	110	111	64	65	66	67	68	68	69
	Prehypertensive	104 – 107	105 – 108	106 – 109	108 – 111	110 – 113	111 – 114	112 – 115	65 – 68	66 – 69	67 – 70	68 – 71	69 – 72	69 – 73	70 – 73
	Hypertensive (> or =)	108 – 120	109 – 121	110 – 123	112 – 125	114 – 126	115 – 128	116 – 128	69 – 82	70 – 83	71 – 84	72 – 85	73 – 86	74 – 86	74 – 87
	Priority Refer (> or =)	121	122	124	126	127	129	129	83	84	85	86	87	87	88
6	Normotensive (< or =)	104	105	107	109	110	112	112	67	67	68	69	70	71	71
	Prehypertensive	105 – 108	106 – 109	108 – 111	110 – 113	111 – 114	113 – 116	113 – 116	68 – 71	68 – 71	69 – 72	70 – 73	71 – 74	72 – 75	72 – 75
	Hypertensive (> or =)	109 – 121	110 – 122	112 – 124	114 – 126	115 – 128	117 – 129	117 – 130	72 – 85	72 – 85	73 – 86	74 – 87	75 – 88	76 – 89	76 – 89
	Priority Refer (> or =)	122	123	125	127	129	130	131	86	86	87	88	89	90	90
7	Normotensive (< or =)	105	106	108	110	112	113	114	69	69	70	71	72	73	73
	Prehypertensive	106 – 109	107 – 110	109 – 112	111 – 114	113 – 116	114 – 117	115 – 118	70 – 73	70 – 73	71 – 74	72 – 75	73 – 76	74 – 77	74 – 77
	Hypertensive (> or =)	110 – 122	111 – 123	113 – 125	115 – 127	117 – 129	118 – 130	119 – 131	74 – 87	74 – 87	75 – 88	76 – 89	77 – 90	78 – 91	78 – 91
	Priority Refer (> or =)	123	124	126	128	130	131	132	88	88	89	90	91	92	92

Keep in mind that for all ages and heights a BP measurement that is > or = 120/80 (diastolic and/or systolic) is considered prehypertensive, unless the BP reading for the student's height and age is in the hypertensive category.

Keep in mind that for all ages and heights a BP measurement that is > or = 120/80 (diastolic and/or systolic) is considered prehypertensive, unless the BP reading for the student's height and age is in the hypertensive category.

(Chart for Males)

		Systolic BP, mm Hg							Diastolic BP, mm Hg						
Age	Interpretation	Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
8	Normotensive (< or =)	106	108	109	111	113	114	115	70	71	71	72	73	74	75
	Prehypertensive	107 – 110	109 – 111	110 – 113	112 – 115	114 – 117	115 – 118	116 – 119	71 – 74	72 – 75	72 – 76	73 – 77	74 – 78	75 – 78	76 – 79
	Hypertensive (> or =)	111 – 124	112 – 125	114 – 127	116 – 128	118 – 130	119 – 132	120 – 132	75 – 88	76 – 89	77 – 90	78 – 91	79 – 92	79 – 92	80 – 93
	Priority Refer (> or =)	125	126	128	129	131	133	133	89	90	91	92	93	93	94
9	Normotensive (< or =)	108	109	111	113	114	116	117	71	72	73	74	75	75	76
	Prehypertensive	109 – 112	110 – 113	112 – 115	114 – 117	115 – 118	117 – 120	118 – 120	72 – 75	73 – 76	74 – 77	75 – 78	76 – 79	76 – 80	77 – 80
	Hypertensive (> or =)	113 – 125	114 – 126	116 – 128	118 – 130	119 – 132	121 – 133	121 – 134	76 – 89	77 – 90	78 – 91	79 – 92	80 – 93	81 – 93	81 – 94
	Priority Refer (> or =)	126	127	129	131	133	134	135	90	91	92	93	94	94	95
10	Normotensive (< or =)	110	111	113	114	116	118	118	72	72	73	74	75	76	77
	Prehypertensive	111 – 114	112 – 115	114 – 116	115 – 118	117 – 120	119 – 121	119 – 122	73 – 76	73 – 77	74 – 78	75 – 79	76 – 80	77 – 80	78 – 81
	Hypertensive (> or =)	115 – 127	116 – 128	117 – 130	119 – 132	121 – 133	122 – 135	123 – 135	77 – 90	78 – 91	79 – 91	80 – 93	81 – 93	81 – 94	82 – 95
	Priority Refer (> or =)	128	129	131	133	134	136	136	91	92	92	94	94	95	96
11	Normotensive (< or =)	112	113	114	116	118	119	120	73	73	74	75	76	77	77
	Prehypertensive	113 – 116	114 – 117	115 – 118	117 – 120	119 – 122	120 – 123	121 – 124	74 – 77	74 – 77	75 – 78	76 – 79	77 – 80	78 – 81	78 – 81
	Hypertensive (> or =)	117 – 129	118 – 130	119 – 132	121 – 134	123 – 135	124 – 137	125 – 137	78 – 91	78 – 91	79 – 92	80 – 93	81 – 94	82 – 95	82 – 95
	Priority Refer (> or =)	130	131	133	135	136	138	138	92	92	93	94	95	96	96

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(Chart for Males)

		Systolic BP, mm Hg							Diastolic BP, mm Hg						
Age	Interpretation	Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
12	Normotensive (< or =)	114	115	117	119	120	122	122	73	74	74	75	76	77	78
	Prehypertensive	115 – 118	116 – 119	118 – 121	120 – 122	121 – 124	123 – 126	123 – 126	74 – 77	75 – 78	75 – 79	76 – 80	77 – 81	78 – 81	79 – 82
	Hypertensive (> or =)	119 – 131	120 – 132	122 – 134	123 – 136	125 – 138	127 – 139	127 – 140	78 – 91	79 – 92	80 – 93	81 – 94	82 – 95	82 – 95	83 – 96
	Priority Refer (> or =)	132	133	135	137	139	140	141	92	93	94	95	96	96	97
13	Normotensive (< or =)	116	117	119	121	123	124	125	74	74	75	76	77	78	78
	Prehypertensive	117 – 120	118 – 121	120 – 123	122 – 125	124 – 127	125 – 128	126 – 129	75 – 78	75 – 78	76 – 79	77 – 80	78 – 81	79 – 82	79 – 82
	Hypertensive (> or =)	121 – 133	122 – 135	124 – 136	126 – 138	128 – 140	129 – 141	130 – 142	79 – 92	79 – 92	80 – 93	81 – 94	82 – 95	83 – 96	83 – 96
	Priority Refer (> or =)	134	136	137	139	141	142	143	93	93	94	95	96	97	97
14	Normotensive (< or =)	119	120	122	124	125	127	127	74	75	76	77	78	78	79
	Prehypertensive	120 – 123	121 – 124	123 – 126	125 – 127	126 – 129	128 – 131	128 – 131	75 – 79	76 – 79	77 – 80	78 – 81	79 – 82	79 – 83	80 – 83
	Hypertensive (> or =)	124 – 136	125 – 137	127 – 139	128 – 141	130 – 143	132 – 144	132 – 145	80 – 92	80 – 93	81 – 94	82 – 95	83 – 96	84 – 97	84 – 97
	Priority Refer (> or =)	137	138	140	142	144	145	146	93	94	95	96	97	98	98
15	Normotensive (< or =)	121	123	124	126	128	129	130	75	76	77	78	79	79	80
	Prehypertensive	122 – 125	124 – 126	125 – 128	127 – 130	129 – 132	130 – 133	131 – 134	76 – 80	77 – 80	78 – 81	79 – 82	80 – 83	80 – 84	81 – 84
	Hypertensive (> or =)	126 – 139	127 – 140	129 – 141	131 – 143	133 – 145	134 – 147	135 – 147	81 – 93	81 – 94	82 – 95	83 – 96	84 – 97	85 – 98	85 – 98
	Priority Refer (> or =)	140	141	142	144	146	148	148	94	95	96	97	98	99	99

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(Chart for Males)

		Systolic BP, mm Hg							Diastolic BP, mm Hg						
Age	Interpretation	Percentile of Height							Percentile of Height						
		5th	10th	25th	50th	75th	90th	95th	5th	10th	25th	50th	75th	90th	95th
16	Normotensive (< or =)	124	125	127	129	130	132	133	77	77	78	79	80	81	81
	Prehypertensive	125 – 128	126 – 129	128 – 131	130 – 133	131 – 134	133 – 136	134 – 136	78 – 81	78 – 82	79 – 82	80 – 83	81 – 84	82 – 85	82 – 86
	Hypertensive (> or =)	129 – 141	130 – 142	132 – 144	134 – 146	135 – 148	137 – 149	137 – 150	82 – 95	83 – 95	83 – 96	84 – 97	85 – 98	86 – 99	87 – 99
	Priority Refer (> or =)	142	143	145	147	149	150	151	96	96	97	98	99	100	100
17	Normotensive (< or =)	126	127	129	131	133	134	135	79	79	80	81	82	83	83
	Prehypertensive	127 – 130	128 – 131	130 – 133	132 – 135	134 – 137	135 – 138	136 – 139	80 – 83	80 – 84	81 – 85	82 – 86	83 – 86	84 – 87	84 – 88
	Hypertensive (> or =)	131 – 144	132 – 145	134 – 146	136 – 148	138 – 150	139 – 151	140 – 152	84 – 97	85 – 98	86 – 98	87 – 99	87 – 100	88 – 101	89 – 102
	Priority Refer (> or =)	145	146	147	149	151	152	153	98	99	99	100	101	102	103

Keep in mind that for all ages and heights a BP measurement that is > or = 120/80 (diastolic and/or systolic) is considered prehypertensive, unless the BP reading for the student's height and age is in the hypertensive category.

For students or personnel over 18 years of age, use the following guidelines for determining if the blood pressure measurement is normal, prehypertensive, hypertensive, or in the priority range.

- Normotensive: systolic < 120 mm Hg; diastolic < 80 mm Hg
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- Hypertensive: systolic > or = 140 mm Hg and/or diastolic > or = 90 mm Hg
- Priority Referral: systolic > or = 160 mm Hg and/or diastolic > or =100

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